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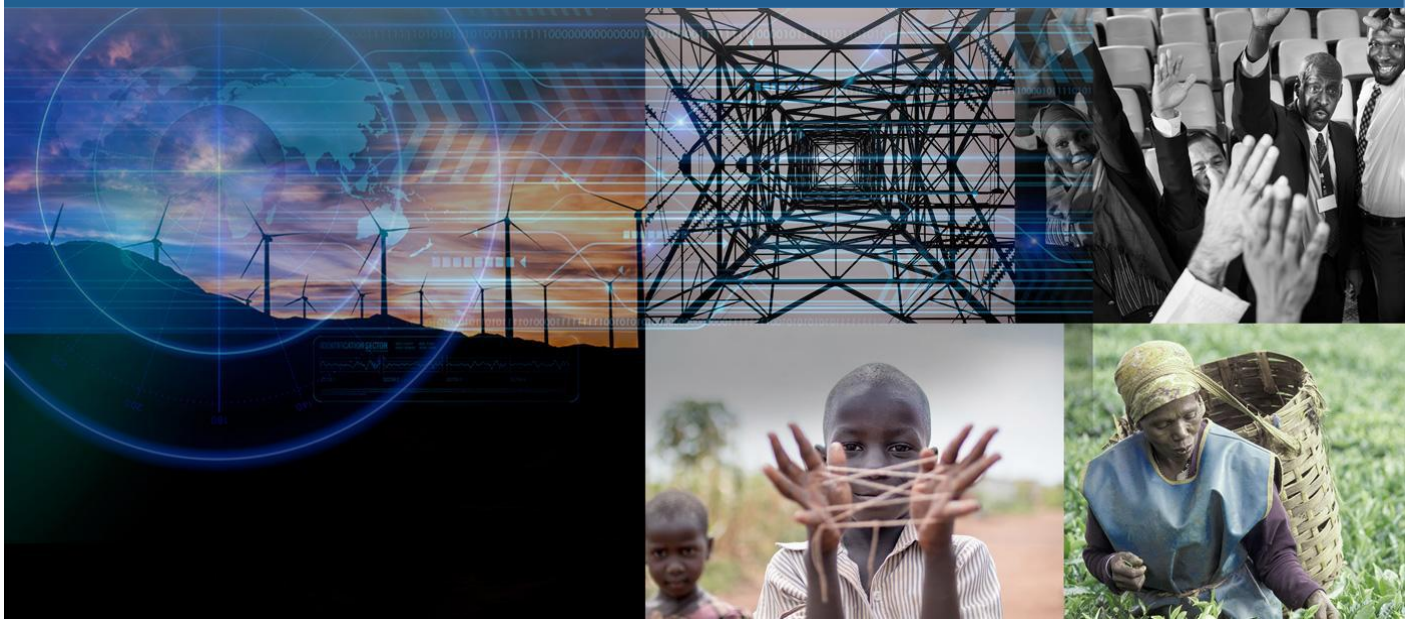

PAN-CONTINENTAL MARKET ASSESSMENT AND STAKEHOLDER MAPPING

For Microsoft

Prepared by Africa Practice

May 2021

1 INTRODUCTION AND METHODOLOGY

Microsoft is considering expanding its agri-technology business across Africa, requiring sizeable investment in time and capital and strategic alignment regarding the route to market. To inform the early stages of the internal decision-making process, Microsoft has commissioned Africa Practice to develop a market assessment opportunity scoping.

To deliver the mandate, we adopted a heterodox approach to assess the significance of the opportunity in the sector in Africa, gauging megatrends on continental scale, and facilitating as well as inhibiting factors. To assess the total addressable market as part of the exercise, we first assessed the total market size of Africa's agricultural sector and the agri-technology market on the continent on the basis of existing value, growth, trade and productivity assessment and growth predictions. In a second step, we aimed at establishing the value of Microsoft's market in relation to the market size, using a number of variables informed by growth factors and challenges, and related growth predictions.

For the smallholder market – Africa's largest agricultural market segment – we were able to express the market value in monetary terms, using assumptions based on extensive market participant surveys in the public domain. A similar approach is not available for mid-size and industrial-scale farms given lack of reliable data on their current penetration across the continent, as well as their level of technology adoption. Moreover, country insights suggest that the total number of industrial-scale farms on the continent remains limited, resulting in a small customer base. However, anecdotal insights across three selected markets that represent different types of agricultural economies are provided to exemplify the potential across medium-sized and industrial-scale farms, and its limitations.

The alternative to the value assessment approach adopted by this study would be to take the total number of farmers, estimate their average annual profit, estimate current expenditure on agritech, and then extrapolate against expected sector and income growth. However, the lack of reliable data and, more importantly, business considerations by the potential client base, rendered this approach unfeasible for the purpose of this study.

Specifically, digital service providers have learned that farmers will rarely pay for digital products and services that are not integrated into broader services offerings already used by the farmer (e.g. electronic payment) until a clear benefit has been demonstrated and the productivity and yield/ profitability increases can be realisable over a short span of time. As a consequence, the value approach for the largest customer base (smallholders) alongside strategic insights and recommendations for other customer bases, including intermediaries, and route to market, presents the most accurate means of estimating the total addressable market.

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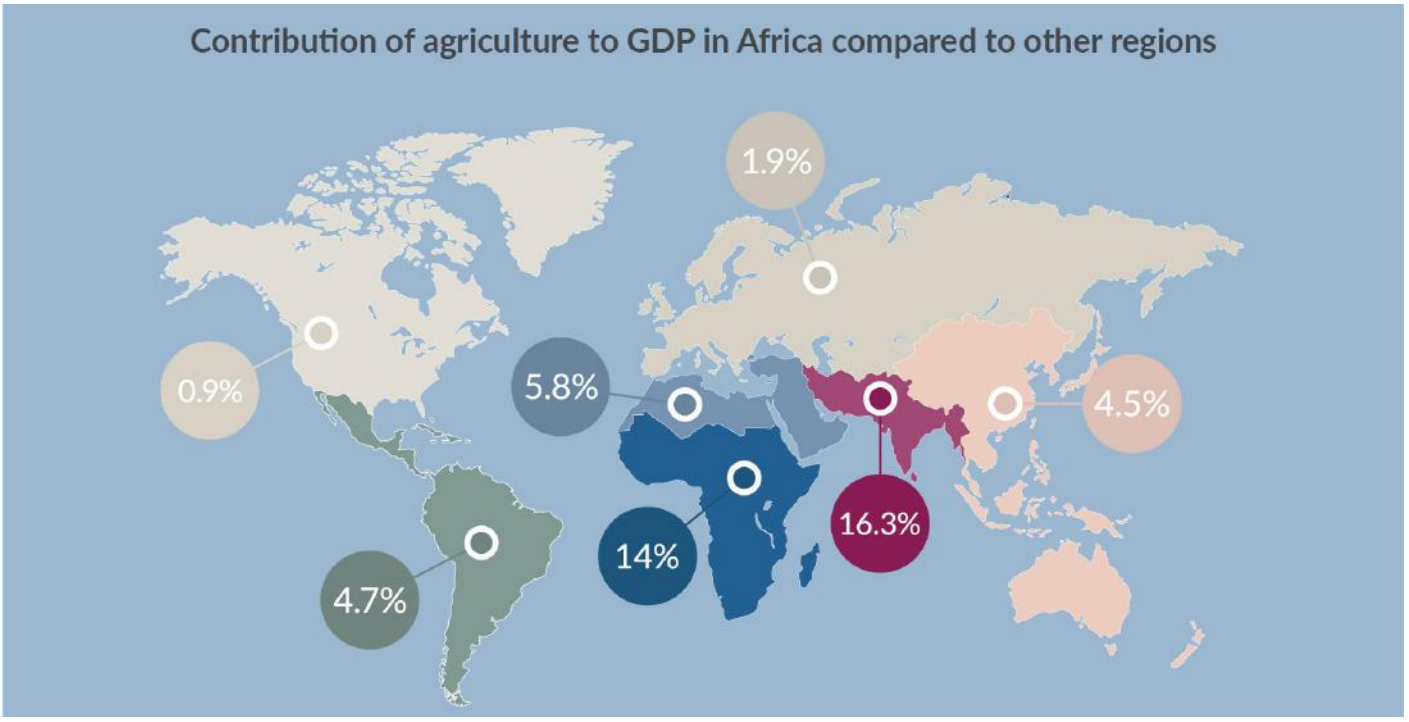
3 TOTAL ADDRESSABLE MARKET

The most conservative estimate for the **TOTAL ADDRESSABLE MARKET** for **MICROSOFT IN THE AFRICAN AGRITECH SPACE** is **USD 343 MILLION**, assuming a lower level of mobile access among smallholders, or **USD 615 MILLION**, assuming a higher level of mobile access. Removing all connectivity constraints, our estimate is significantly higher – **USD 879.5 MILLION.**

Based on our bespoke methodology and using penetration assessments and growth predictions in the public domain, in the two sections below we outline the structural factors, statistics and rationale behind these figures – focusing first on a market size assessment, and then on a market value one. These figures do not take into account potential opportunities in secondary markets such as the opportunity to sell solutions to intermediary actors such as finance providers. Our estimates are predominantly limited to direct users of agritech solutions such as smallholders, agribusinesses, governments and commercial players.

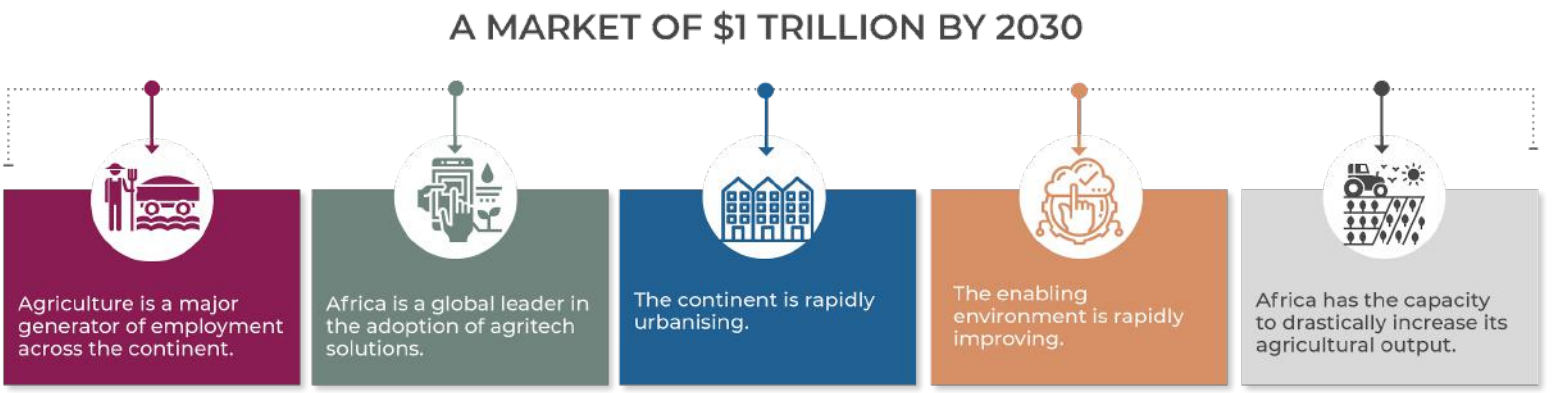
3.1 Market size assessment

Agriculture is a major driver of economic growth in Africa, contributing 14% of overall GDP across the continent. The total value of agricultural output has grown markedly over the past decade, and rising **urbanisation** and the growth of the urban middle-class in Africa are expected to contribute to further growth.



By **2030**, the **AGRICULTURE** sector in sub-Saharan Africa is expected to grow **THREEFOLD** to **USD 1 TRILLION**

In our market size assessment, we identified five growth axes that merit attention and are overviewed below.



3.1.1 A generator of employment

Agriculture is a key main generator of employment in the majority of African countries - according to the World Bank, as at 2020, 52% of the workforce in Africa was employed in the sector. Around 60% of the overall population is currently employed as smallholder farmers, representing about 80% of all farming activity on the continent.

3.1.2 Rapid urbanisation

With urban dwellers expected to consume more fresh produce, dairy and processed food in the coming decade, USD 167 billion of this could be spent on food and beverages. Overall, the African Development Bank (AfDB) estimates that the agriculture sector in Africa – currently valued at USD 313 billion – could grow threefold by 2030 to around USD 1 trillion.

Despite this strong growth in past decades, the continent has remained a net importer of food products due to suboptimal output and a focus on export crops. From 2016 to 2018, Africa imported about 85% of its food

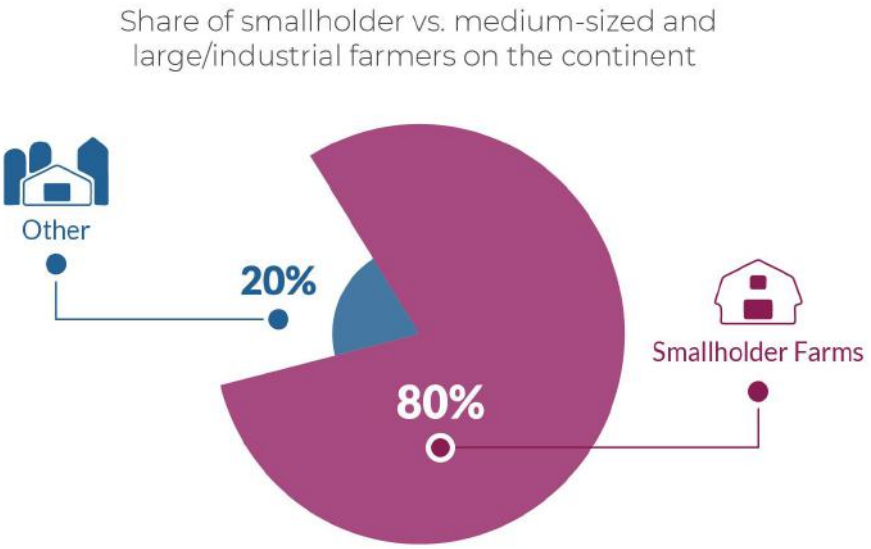
from outside the continent, resulting in an annual food import bill of USD 35 billion; this bill is set to increase to USD 110 billion by 2025 and USD 150 billion by 2030, according to the UN. In the face of this, some African governments are taking steps to develop their export industry.

Rapid urbanisation has also led to the consolidation of land, facilitating a shift towards industrial-scale farming in more developed economies. According to the UN, the rate of urbanisation is accelerating considerably and by 2050, 60% of Africans are projected to reside in urban areas. In the last decade, the value of marketed crop output from medium-scale farms of 5 to 100 hectare has also increased substantially. These largely African-owned farms have been launched by urban-based professionals and investors and are particularly prominent in countries with substantial amounts of underdeveloped land.

MEDIUM-SCALE FARMING now accounts for **20%** of total farmland in **KENYA**, **32%** in **GHANA**, **39%** in **TANZANIA**, and over **50%** in **ZAMBIA**.

However, this trend has not been ubiquitous, and in densely populated countries such as Rwanda and Uganda, medium-scale farms are growing at a far slower rate.

Africa is becoming a key target for large-scale land transactions, and between 2000 and 2016 over 420 industrial farming deals comprising over ten million hectares were completed. However, only a small proportion of these deals have actually been implemented, and the number of active entrants into the industrial farming segment remains low. Consequently, it is unlikely that land expansion will play a central role in boosting production in the near future.



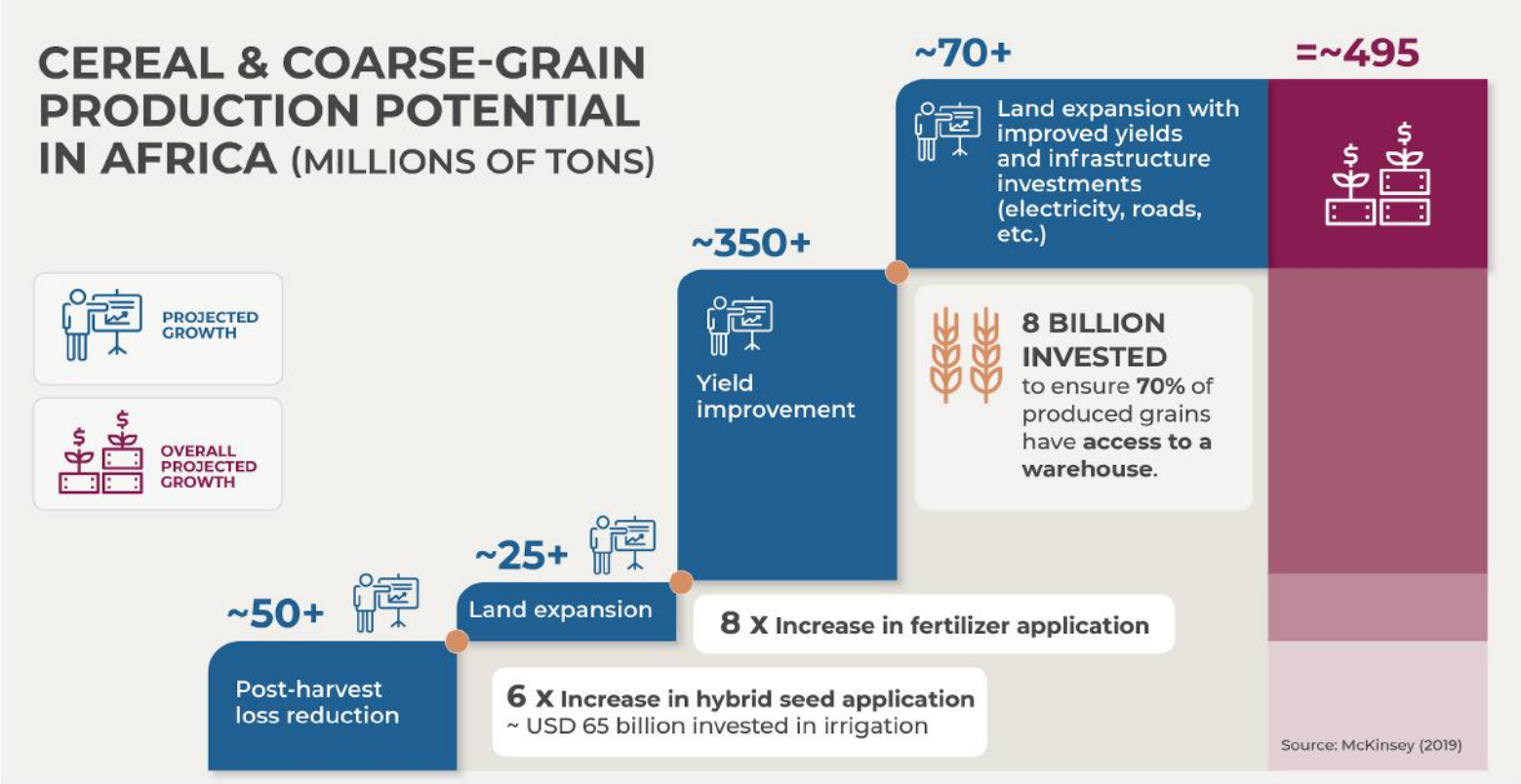
3.1.3 Productivity growth potential

Productivity across Africa's agriculture sector remains low when compared to other regions. According to estimates by the Food and Agriculture Organisation and the Global Yield Gap Atlas, Africa has the capacity to produce two to three times more cereals and grains than it currently does. Yield improvement, particularly smallholder yields, will play the single most important role in increasing output, accounting for approximately 350 of the 495 million tons that the continent could produce over and beyond its current levels. An additional 95 and 50 million tons, respectively, could be secured through land expansion and post-harvest loss reduction.

This growth in yields is predicated on increased investment in a number of areas. Recent studies and analyses by McKinsey suggest that this level of growth in sub-Saharan Africa[1] will require an eight-fold increase in the application of fertilisers, a six-fold increase in the seed market, and a USD 8 billion and USD 65 billion increase

[1] Source: McKinsey, 2019, "Winning in Africa's Agricultural Market". Sub-Saharan Africa is defined as including all African countries except Algeria, Egypt, Libya, Morocco, Tunisia and South Africa.

in investment in crop storage and irrigation facilities respectively. Significant investment will also be required into key infrastructure (roads, electricity) and into the development of more favourable regional trade routes (including the development of more reliable offtake markets).[2]



3.1.4 Global leader in adoption of agritech

Digital solutions have a central role to play in improving productivity in Africa's agriculture sector. From 2013 to 2018, globally, agricultural tech start-ups raised USD 800 million and have been driving increased output across multiple regions. Digital agriculture solutions are cropping up across the world, but Africa is a key hub for innovation. In January 2020, the Global System for Mobile Communications' (GSMA) AgriTech programme registered 105 agritech services in South Asia and 99 in Southeast Asia and the Caribbean. In Africa, GSMA identified 437 agritech providers, spread across 43 countries.

The continent is seeing a rapid increase in market entrants. The Technical Centre for Agricultural and Rural Cooperation (CTA) estimates that between 2016 and 2019, the sector in Africa grew at a rate of 44% per year[3]

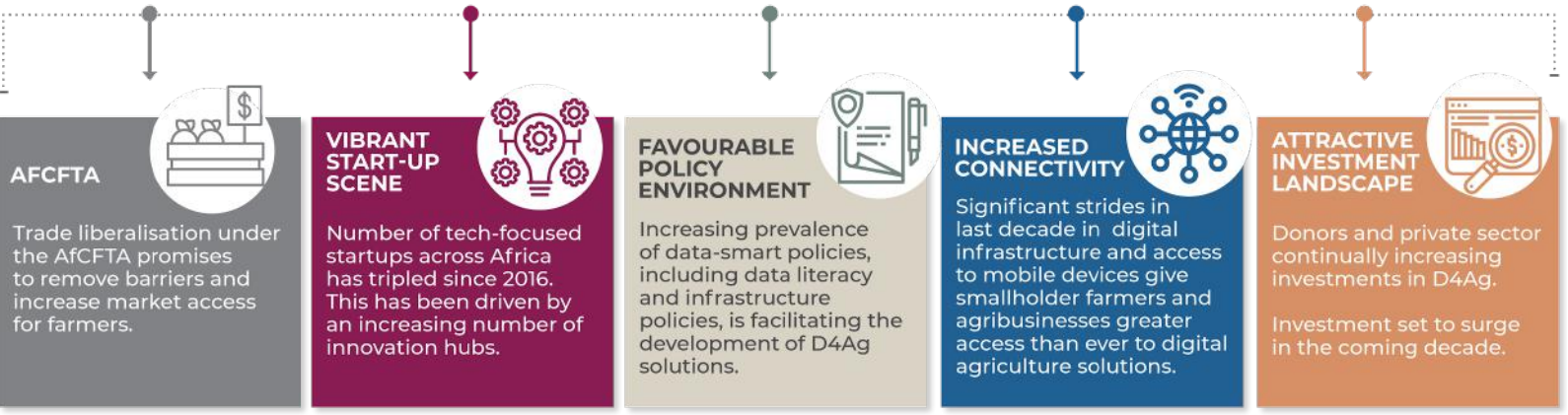
DIGITAL SOLUTIONS PROVIDERS have so far registered over **33 MILLION SMALLHOLDER FARMERS AND PASTORALISTS** across the continent, representing **13% OF ALL AFRICAN SMALLHOLDERS AND PASTORALISTS.**

[2] The below visual is adapted from the above study, which in turn utilises data from the FAO and the Global Yield Gap Analysis.
[3] Source: Technical Centre for Agricultural and Rural Cooperation (CTA), 2018-2019, "The Digitalisation of African Agriculture".

If the above growth trends continue, CTA projects that these solutions should reach the majority of African smallholder farmers by 2030.

3.1.5 Improving enabling environment

There is consensus among high-level decision-makers in Africa around the need to develop **robust policy and regulatory frameworks** to support the growth of the digital economy and of the agriculture sector. Three key policy areas which are receiving increased attention are digital literacy, data costs and data privacy.



As the pandemic has brought home to decision-makers the importance of developing a robust digital economy framework in Africa, digital and e-commerce issues are now being also pushed up the **African Continental Free Trade Agreement (AfCFTA)**[4] agenda, and are due to be included in the second phase of negotiations in early 2021.

INTRA-AFRICAN AGRICULTURAL TRADE is expected to increase by **49%. 60%** of African countries will see **INCREASED AGRICULTURAL EMPLOYMENT** by **2035**, according to the World Bank.

If implemented effectively, the AfCFTA will be key to unlocking the agricultural growth projections outlined for the agriculture sector in our market size assessment. These trends could significantly boost the total addressable market for tech players, increase the purchasing power of smallholder farmers, and place e-commerce more centrally within agricultural trade strategies.

Parallel to this, both **donors and private sector financiers** are continually increasing their investments in the digital agriculture sector. From 2016 to 2018, private investment increased by tenfold, to EUR 47 million, and in 2020, agritech was the second-largest recipient of venture capital funding in Africa, coming just behind fintech.

Private investments are largely targeting **INPUTS, PRODUCTION AND BIG DATA PLATFORMS** (including market linkage) as a means of driving productivity and incomes among smallholder farmers.

[4] In January 2021, the trade portion of the AfCFTA was operationalised, meaning signatories are now obligated to publish reduced tariff offerings with a view to creating a common trading bloc.

Some of the largest beneficiaries in recent years include: Nigeria's Thrive Agric and Ghana's Agrocenta, which provides access to finance and inputs for smallholders; Kenya's Twiga Foods market linkage platform; and Ivorian weather app Ignitia. As small companies continue to grow, and form partnerships with big tech players, which allow them to deliver solutions at scale, private investment in the sector is set to surge in the coming decade.

It has been particularly encouraging to see the high numbers of multinational tech and communications firms that are becoming involved in the **tech hub scene** across the continent. We expect this trend to continue in the coming years as donors and financiers continue to invest more heavily in the tech space. Since 2016, the number of tech-focused hubs across Africa has almost tripled, from around 239 to 618, according to figures published by GSMA.

The continent has also made significant strides in the last decade towards enhancing **connectivity**, through the development of digital infrastructure, the expansion of mobile networks and increasing the accessibility of smartphones and data. These developments are facilitating access to mobile services and digital agriculture tools. Subsea cables such as MainOne, Orange's Djoliba, Facebook's 2Africa and Google's Equiano are set to enhance connectivity throughout the continent.

MOBILE SUBSCRIPTION PENETRATION increased from 40% in 2015 to 45% in 2019 and is expected to reach over **55% by 2030.**

This could translate into up to 85% phone ownership at smallholder farmer level by 2030, with smallholder farmers and agribusinesses having greater access than ever to digital agriculture solutions.

3.2 Market value assessment

We assess that Africa's **VAST SMALLHOLDER FARMER SEGMENT** will provide the **GREATEST OPPORTUNITIES FOR MICROSOFT**. Intermediary players – such as NGOs, governments and agribusinesses – can be leveraged by Microsoft to enhance penetration on the continent and exploit future growth prospects in the sector, while also providing a client base in themselves.

3.2.1 The smallholder market

The smallholder market represents the largest demographic segment in Africa. While the medium-scale segment is growing consistently, this is not ubiquitous and largely restricted to countries with significant amounts of uncultivated land. Land acquisition by medium-size farmers (5-10ha) has indeed increased tremendously in some countries, but this has not always translated into growth of cultivated land in the same markets, often as a consequence of lack of access to finance. Investment, productivity and value increase have therefore often been higher in the smallholder segment than by medium-sized farms – both in total numbers and in percentage increase.

For instance, a 2019 Agricultural Economics study found that in Tanzania and Zambia – which have experienced record growth in the medium-sized farm sector – the share of growth in value of farm output by smallholders grew 53% and 54% respectively, whereas the share of growth by medium-sized farms grew only by 26% in both countries. Only Ghana stands out, with smallholders and medium-scale farmers seeing growth of 40% and 52% respectively. This is largely due to the professionalisation of Ghana's agricultural sector, where industrial medium-sized farms now hold more land than commercial smallholders. These growth figures directly translate into investment levels by farmers, since, as established above, productivity increase largely depends on yield increase, which in turn depends on the deployment of improved technology and input.

Similarly, while there has been significant growth in the large-scale industrial agriculture sector in the last decade, this has been inconsistent across the continent, with many key markets seeing very few entrants into this segment. For example, in Nigeria, there are currently only about 100 farms larger than 50 hectares and the share of growth in value of farm output over the past decade has been at or below 20% across all countries surveyed in the same study.

So, while industrial agriculture contributes significantly in some countries, the overall customer base on the continent remains limited. As a consequence, commercial smallholders with the potential to grow their farmland within the smallholder segment and to migrate into middle-sized farms over time, are the most promising customer base as they will contribute the most to the forecasted tripling of the continent's agriculture sector by 2030.

SMALLHOLDER FARMERS are the **MAIN USERS** and main investors in the agritech space. The most ambitious current growth trends suggest that **100 MILLION** smallholder farmers could be registered for digital services by 2021 and as many as **200 MILLION** smallholders will sign on by **2030**

3.2.2 Total addressable market estimates

We present multiple scenarios for the total addressable market in Africa relating to the smallholder segment: scenario 1 disregards all connectivity constraints on the continent, while scenario 2 takes these constraints into account, and presents a conservative and an ambitious estimate for the total addressable market.

- **Under Scenario 1**, assuming no connectivity constraints, the total addressable market for smallholders in Africa is estimated to be between USD 879.5 million and USD 9.19 billion.

- **Under Scenario 2**, the estimates are considerably lower, as these take into account digital constraints. Our conservative estimate is between USD 343 million and USD 3.58 billion, while our ambitious estimate ranges from USD 615 million to USD 6.43 billion.

Under each scenario, we provide an estimate of the minimum and maximum revenues that can be expected for each service, based on consumers' cost appetite and financial standing. These "value assumptions" – the assumptions regarding the minimum and maximum expenditure that potential clients are both willing and able to spend – are based on a comprehensive 2018 market survey conducted for CTA that assessed cost appetite, including risk appetite, and financial means, both through disposable income and financial instruments.

The estimates also operate under a set of key assumptions: they apply only to advisory, financial access, market linkage and supply chain services. They assume it is possible to have multiple subscribers from one family to advisory services, meaning every smallholder is included in the addressable market for advisory services. Another assumption is that a farm or household counts as a single unit as regards financial, market linkage and supply chain services, making multiple subscriptions for these services highly unlikely.

The details behind these estimates are also tabulated below:[5]

SOLUTIONS	ADDRESSABLE FARMERS (MILLION)	ANNUAL EXPENDITURE PER USER (USD)		TOTAL ADDRESSABLE MARKET (MILLION)	
		MIN	MAX	MIN	MAX
Advisory services	250	$1.20	$10.90	$303.30	$2,730
Financial access	73	$3.64	$16.90	$265.70	$1,240
Market linkage	73	$3.64	$60.60	$265.70	$4,429
Supply chain management	73	$0.60	$10.90	$44.80	$797
SCENARIO 1 TOTAL (assuming no connectivity constraints)				$879.5	$9,196
SCENARIO 2 TOTAL (factoring in connectivity constraints)					
CONSERVATIVE ESTIMATE[6]				$343	$3,586
AMBITIOUS ESTIMATE[7]				$615	$6,437

3.2.3 Gaining access to the smallholder market

Digital solutions providers seeking to have a high impact on the continent face a difficult dilemma as much of the potential client base is difficult to reach and still lacks purchasing power. In light of these barriers, understanding the role that other market groups could play in opening the smallholder market to Microsoft is key. Microsoft could thus adopt a multi-stakeholder approach to penetrating the smallholder market.

The majority of smallholder farmers in Africa access tech solutions via extension services, provided by NGOs, governments or agribusinesses. It is the agribusiness market that provides the strongest opportunities for Microsoft, both in terms of accessing smallholders and as an end client in its own right. Agribusinesses currently only account for a small proportion of the agritech services marketed to smallholder farmers in Africa.

However, agribusinesses provide a crucial service to smallholders. Thus, working through agribusinesses will greatly increase accessibility to digital solutions for smallholder farmers. Agribusinesses will have a strong

[5] This approach has been adopted in line with the above mentioned CTA study. All assumptions around addressable farmers, the value of specific services, and levels of connectivity among smallholders are derived from this study.
[6] Assuming 39% of African smallholders have a unique mobile subscription, as reported by GSMA in 2018.
[7] Assuming 70% of smallholders in Africa have access to at least one phone in their household, based on data collected by the Consultative Group to Assist the Poor's smallholder diaries.

motivation to invest heavily in digital solutions in the coming decade; their addressable market is intrinsically tied to the strength and purchasing power of farming bases. As the fertilizer and seed market could increase eight and six-fold by 2030, there is a direct business justification for investing more heavily in, or partnering with, extension services in order to drive smallholder growth and productivity. For more information on specific value chains which offer opportunities for Microsoft, please see Section 4.1.8.

3.2.4 Route to market

Based on our above findings, we recommend that Microsoft focus on developing digital solutions which are targeted at and can be applied across a single vertical market in Africa. Given the dominance of smallholders on the continent, and the projected increases in productivity in cereals and grains in the coming decade, we believe the cereals and grains market represents a strong opportunity for Microsoft in this regard.

Microsoft could aim to assist smallholder farmers in improving their yields by providing advisory services and extension services. Similarly, Microsoft could support farmers' access to markets with market linkage and market information services, as well as payment solutions, and could facilitate end-user delivery by developing solutions to connect transporters.

Agribusinesses can be leveraged as crucial intermediaries in this process; as the sector is projected to grow rapidly in the coming decade, agribusinesses will be well-positioned to increase accessibility to digital solutions for farmers.

4 OPPORTUNITIES

With ongoing COVID-19-related restrictions on movement, interacting with farmers and value chain partners digitally has become critical. Responding to the challenging operating environment, farmers and agribusinesses are likely to seek out e-advice services, and to require access to digital financial products. This will create more opportunities for big tech players, telecoms operators and financial services providers to enter the digital agriculture space.

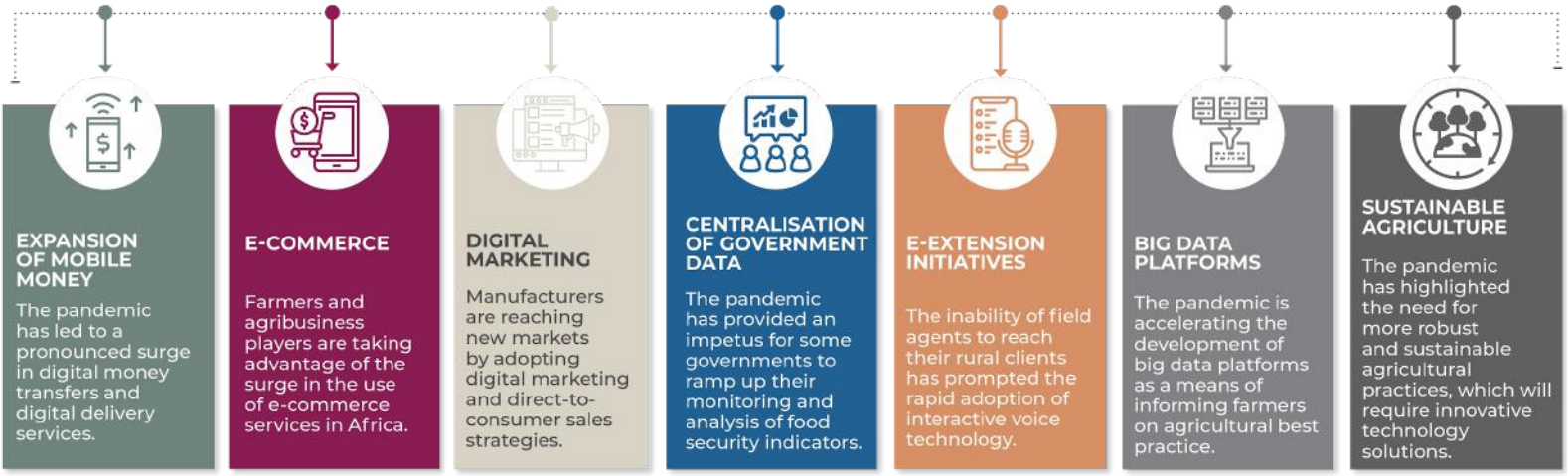
In the last five years, there has been a proliferation of digital solutions for agriculture across the continent. In 2019, CTA identified a total of 390 active solutions on the continent, a conservative estimate excluding donor-financed and short term agric-tech deployments. Of the total, about 60% (227 in total) launched between 2017-2019. In regards to use cases, about two-thirds of the solutions identified primarily offer advisory and information.

The popularity of advisory services, particularly among donors and private entities, has been attributed to the limited complexity characterised by little-to-no coordination required with other actors in the value chain as well as the ability to proffer solutions without deep expertise. More complex use cases – for example, financial access, supply chain management and macro solutions – are still limited in number. In addition to increased close collaboration, they require large financial investments towards infrastructural development including mature enterprise frameworks that promote interoperability, and advanced data analytics software.

With increased **MATURITY, SPREAD AND INVESTMENTS**, these solutions are likely to continue to **GROW IN DEMAND**

4.1 Pan-continental

We identified seven key trends that have gathered significant momentum in the last year, signalling greater adoption of digital solutions in agriculture in the near future and opening up opportunities for Microsoft.



4.1.1 Sustainable agriculture

The agriculture sector has become one of the main contributors to greenhouse gas emissions on the continent. As at 2016, agriculture and associated sectors contributed to around 56% of the continent's total emissions, with the majority of emissions resulting from livestock and land degradation.

There is an urgent need to increase the resilience of the agriculture sector to climate change, and to ensure the agriculture sector becomes a vector for climate change mitigation. One very promising trend in the sustainability space is the shift to low emissions dairy farming in **East Africa**. It is now becoming evident that low-emission dairy practices can serve to both improve the livelihoods of dairy farming households by enhancing milk productivity, and to lower the GHG emissions intensity per litre of milk produced. It is therefore a highly attractive prospect for farmers, as well as for governments which are keen to stick to international emissions pledges. Kenya is taking the lead, with the government seeking to lower emissions by improving the quality of animal fodder. Tanzania is also experimenting with solutions through its Greening Livestock Project.

These shifts towards **LOW EMISSIONS STRATEGIES** will require more effective management and **SHARING OF CLIMATE-RELATED INFORMATION.**

Governments and businesses will need more advanced e-extension services to provide remote farmers with information on how to make their operations climate-friendly. This provides an opportunity for Microsoft to engage with extension service providers as a means of reaching farming communities. Further, at present emissions data in Africa is poorly managed, preventing suitable analysis and hindering policymaking. It is likely big tech players will be increasingly in demand to help consolidate disparate data across the continent and inform government decision making.

4.1.2 Expansion of mobile money

The pandemic has led to a pronounced surge in digital money transfers and digital delivery services. Governments and private actors have sought to lower data costs for consumers and to reduce the costs of digital financial transactions, further catalysing this.

In **2020**, **MOBILE MONEY USAGE** increased by **9.9%, 14.1%, 13.8%, 14.5%** in Eastern, Central, Southern and Western Africa regions.

This trend has been particularly evident in East Africa, where in 2020 **Rwanda** registered a five-fold increase in mobile money transactions compared to pre-pandemic figures. This trend will facilitate greater access for smallholder farmers to financial services which has the potential to dramatically increase their purchasing power.

4.1.3 E-commerce connecting farmers to customers

Some agribusiness players are already taking advantage of the surge in the use of e-commerce services in Africa. As well as expanding the scope of market access for smallholder farmers, these platforms also provide the middle classes with an alternative to overcrowded marketplaces which continue to be a vector for COVID-19 infection.

- ➔ **TWIGA FOODS.** In April 2020, Twiga Foods signed a partnership with Jumia to allow customers to purchase fresh produce from smallholder farmers via the Juma platform at a reduced cost.
- ➔ **FARMCROWDY.** FarmCrowdy, a Nigerian agri-tech platform that allows people to invest in farms, has also launched an e-commerce platform for fresh produce.
- ➔ Liberian food delivery service **COOKSHOP** has tripled its revenues in 2020 by connecting local food procedures with consumers via its B2C e-commerce platform.
- ➔ Uganda's **BRINGO FRESH** has seen a 30% increase in demand since COVID-19 for its food delivery platform.
- ➔ Zambia's foremost food e-commerce platform **E-MSIKA** has also seen a dramatic surge in demand since the pandemic.

4.1.4 Centralisation of government data

The adverse impact of the pandemic on food security has provided an impetus for some governments to ramp up their monitoring and analysis of food security indicators. For example, the **Kenyan** government established a food-security war room, providing a central body for the collection of key data. It is using this facility to deploy digital tools and data-gathering approaches to manage food availability, accessibility, and affordability. Through this central resource, Kenya is now proactively gathering data on pricing and availability for over a dozen food commodities at a subnational level on a weekly basis, which it is presenting through dashboards.

4.1.5 Big data platforms

The pandemic is accelerating the development of big data platforms as a means of informing farmers on agricultural best practice. In February 2020, the FAO launched a database which monitors daily food price changes and allows farmers and consumers greater visibility of price volatility. The Consortium of International Agricultural Research Centres also launched a set of databases which aim to help farmers, agribusinesses and governments to visualise the key impacts of COVID-19 on food security across the continent.

4.1.6 E-extension initiatives

The inability of field agents to reach their rural clients has prompted the rapid adoption of interactive voice technology:

- In **Uganda**, the NGO Precision Agriculture for Development has been using interactive communication platforms to hold Q&A sessions with out-of-reach coffee farmers.

- In **Ethiopia**, Mercy Corp's Agrifin digitalisation programme has partnered with the Agricultural Transformation Agency of Ethiopia to distribute COVID-19 information to farmers via Whatsapp.

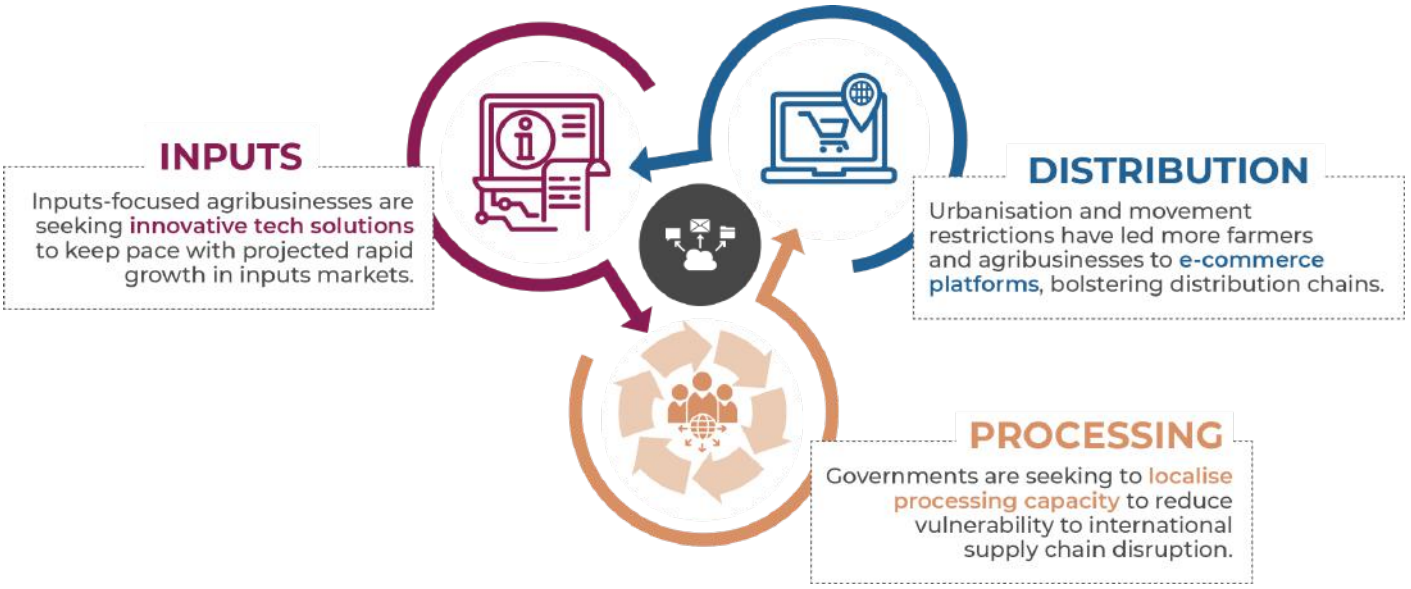
- In **Ghana**, the local start-up Farmerline has been sharing crucial COVID-19 updates with the most vulnerable farming communities through a bespoke voice messaging service.

4.1.7 Digital marketing

In response to the supply chain challenges faced by the food industry during the pandemic, manufacturers are looking to reach new markets and are adopting digital solutions to achieve this, such as digital marketing strategies and direct-to-consumer sales strategies. The increasing shift towards e-commerce platforms, as noted above, as well as the increasing digitalisation of logistics chains and sales operations, will provide valuable avenues to agribusinesses seeking to diversify their consumer base and reduce staff numbers. An increasing number of mergers and acquisitions are likely as larger companies seek to diversify their risk across the value chain, and smaller players scale up their digital capacity in search of new consumers.

4.1.8 Agribusiness value chain opportunities

We identified three key value chains in which agribusinesses will require increased support from digital solutions providers:



- **Inputs**. With inputs markets set to expand dramatically in the coming decade, inputs-focused agribusinesses will require innovative tech solutions to keep pace. Governments are increasingly adopting strategies to expand their inputs markets with a view to bolstering yields and incomes. For example, in Egypt, the government's Vision 2030 calls for greater public investment in fertilizers and seeds; in Nigeria, since 2020 the government has been seeking to limit the import of fertilizers in order to promote domestic production. Several major international inputs providers have already announced plans to establish local operations in Nigeria, most notably OCP.

- **Processing**. Governments are seeking to localise processing capacity to reduce vulnerability to international supply chain disruption. We expect this trend to continue as governments seek greater autonomy from international value chains following the pandemic, and this could lead to an expanded local market for digital solutions providers. The forerunner in this respect has been Cote d'Ivoire, which has taken steps to incentive the local processing of agricultural produce (see Section 4.2.1 for more detail). Other countries are following suit, most notably Zambia, where the government is providing technical and financial support to local soya bean processors.

- **Distribution**. Urbanisation and movement restrictions have seen more farmers and agribusinesses resorting to e-commerce platforms to reach new markets, providing a boost to local distributors (see Section 4.1.3 above).

4.2 Key markets

We have selected Cote d'Ivoire, Ghana and Egypt as promising investment destinations for Microsoft, owing to their significant and ever-growing volumes of agricultural exports, their robust digital policy and regulatory landscapes, and their forward-looking agricultural growth prospects which will require considerable input from digital solutions providers.

This list of markets is not exhaustive, and we assess there to be numerous additional opportunities across the continent for Microsoft to drive impact in the agritech sector. According to the above-referenced study by McKinsey regarding productivity increases on the continent, nine African countries make up 60% of overall production potential, and three countries – **Ethiopia and Tanzania** – comprise around half of this projected

potential. These markets are also seeing robust agricultural growth and strong adoption of digital solutions, and also represent a strong opportunity for Microsoft.

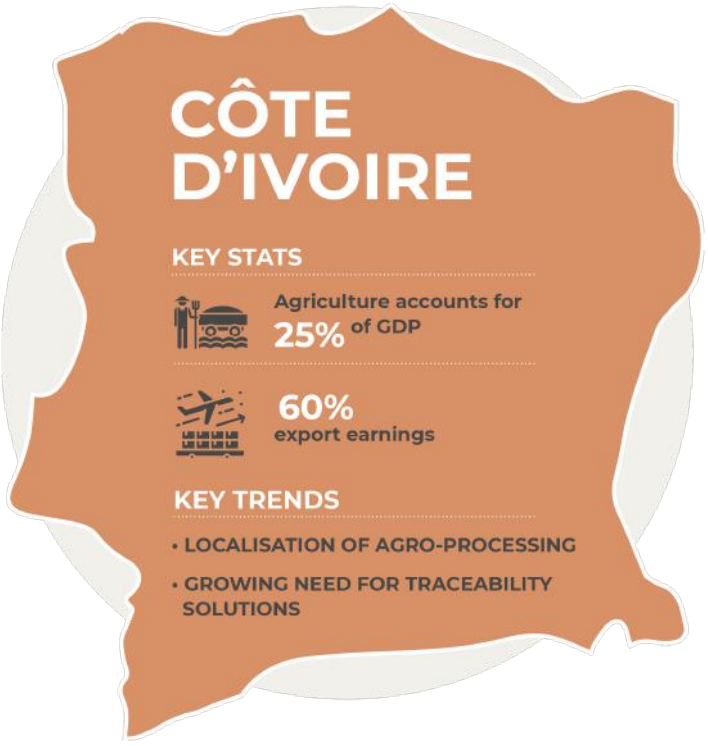
4.2.1 Côte d'Ivoire

Cote D'Ivoire has a diversified and developed agricultural sector when compared to other countries in the region and continent. This is coupled with a receptive policy environment and an already established digital agricultural ecosystem.

The pandemic has highlighted numerous structural deficiencies in the country's agricultural sector, and thus given greater impetus to public and private sector actors to develop innovative solutions to these issues. This is creating a larger market for big tech players to add value.

The government has a robust e-agriculture strategy, which has seen the sector rapidly adopt the use of database technologies, satellite systems, mobile money, and remote sensing technologies, and facilitated the creation of a vibrant innovation market.

The county also has strong relationships with international donors, with over 60% of all financing for the agriculture sector currently being sourced through donors. Donors tend to focus on three key areas; in the field of climate-smart agriculture, GIZ is supporting through the Change Adaptation and Population Stabilization Program; in the area of agricultural finance, the country is benefitting from the World Bank's Global Index Insurance Facility, which aims to support farmers with insurance schemes; and on e-agriculture, the World Bank is also providing significant support to boost smallholders' access to digital tools.



Cote d'Ivoire has one of the most robust start-up ecosystems in Africa, with the number of innovation hubs in the country doubling in the last three years alone.

The country's startup ecosystem mainly consists of companies operating in finance, inputs and climate-smart agriculture. Key players include:

- ➔ **SEEKEWA,** an agri crowdfunding platform
- ➔ **ADVAN,** a mobile credit app catering to the cocoa sector
- ➔ **GRACI**, a company specialising in seeds inputs for the rice sector
- ➔ **IGNITIA**, a company specialising in weather forecasting technology
- ➔ **GRAINOTHEQUE**, which specialises in crop disease diagnostics

The ecosystem is supported by numerous innovation hubs which provide technical, advisory and networking services to startups, including **JANNGO**, **MAKE SENSE, JOKKOLABS, and INCUB'IVOIRE.**

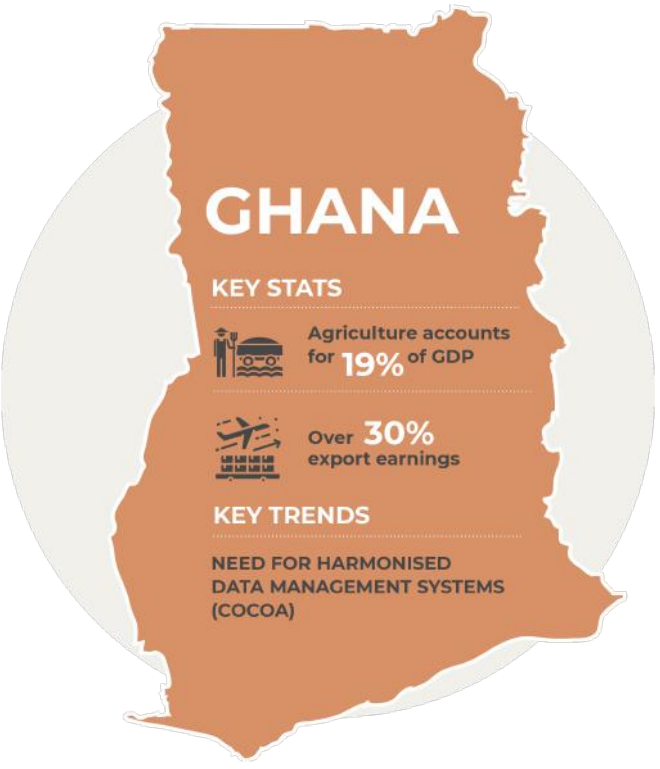
As government and private sector players shift their attention to resolve COVID-19 disruption, greater opportunities for digital innovation are emerging, notably:

- **Localisation of processing.** Côte d'Ivoire supplies the majority of the world's cocoa and cashews; however, the bulk of profits are concentrated elsewhere in the value chain, namely in processing and distribution. Consequently, local farmers only receive a small proportion of the profits generated by this sector globally. To remedy this, the government is taking steps to localise processing by introducing tax incentives to entrepreneurs who opt to run local processing firms, setting an ambitious target of having 50% of produce processed in-country by 2020. This will help boost local economies, limit vulnerability to price shocks, and create an expanded local processing market in need of digital solutions.

- **Traceability.** Investors have become increasingly concerned over reports of corruption, deforestation, the use of child labour and poor working conditions in connection to cocoa production in Côte d'Ivoire. To combat these issues, numerous actors are looking to develop traceability systems, which can allow for greater visibility of the origins of cocoa products: the French NGO Nitidae has partnered with British firm Gaiachain to roll out a blockchain system among certain cooperatives; and the Coffee and Cocoa Council has launched a new system to trace the origins of cocoa, to ensure production does not originate from protected lands.

4.2.2 Ghana

Ghana has a diverse agriculture sector and a highly evolved digital ecosystem and digital policy framework, making it an attractive market for big tech players looking to tailor digital solutions to the agriculture sector. In particular, the country's cocoa sector, which is hampered by numerous organisational and administrative challenges, represents a potential opportunity for big tech to provide innovative data-led solutions and drive productivity.



Ghana has the highest mobile penetration rate in West Africa. This growth has been facilitated by the government's consistent commitment to a robust enabling environment. The government's ICT for Accelerated Development Policy, currently in its fifth phase (2019-2022), has sought to promote an ICT-led development agenda with a view to transforming Ghana into a digitally enabled middle-income country.

Historically Ghana has had close ties to the donor community, but President Akufo-Addo's Ghana Beyond Aid policy aims to

reduce the country's reliance on external support, including agriculture funding. Despite this, the country remains highly reliant on donor funding, with the USA and the World Bank as the most dominant donor partners in the agriculture sector, focusing on crop diversification, research and development and e-agriculture.

This environment has created fertile ground for digital agriculture solutions to grow and expand, and the country has a very strong start-up ecosystem. This has been partially driven by the government's National Entrepreneurship and Innovation Plan.

The start-up scene largely targets agri finance, vehicle rentals, climate-smart agri and commodity traceability. Some major players include:

- ➔ **THRIVE AGRIC,** which provides access to credit and finance for smallholder farmers;
- ➔ **AGROCENTA,** which provides smallholders with access to finance and wider markets;
- ➔ **TROTRO TRACTOR**, a vehicle renting platform connecting farmers to tractor operators via text messages
- ➔ **AQUAMEYER,** a drone tech company which monitors crops and pests
- ➔ **QUALITRACE,** which provides software for the tracking of inputs

There are three key innovation hubs in Ghana: **MEST AFRICA, THE GHANA HUBS NETWORK** and **SMARTHECTAR,** which all specialise in digital skills development.

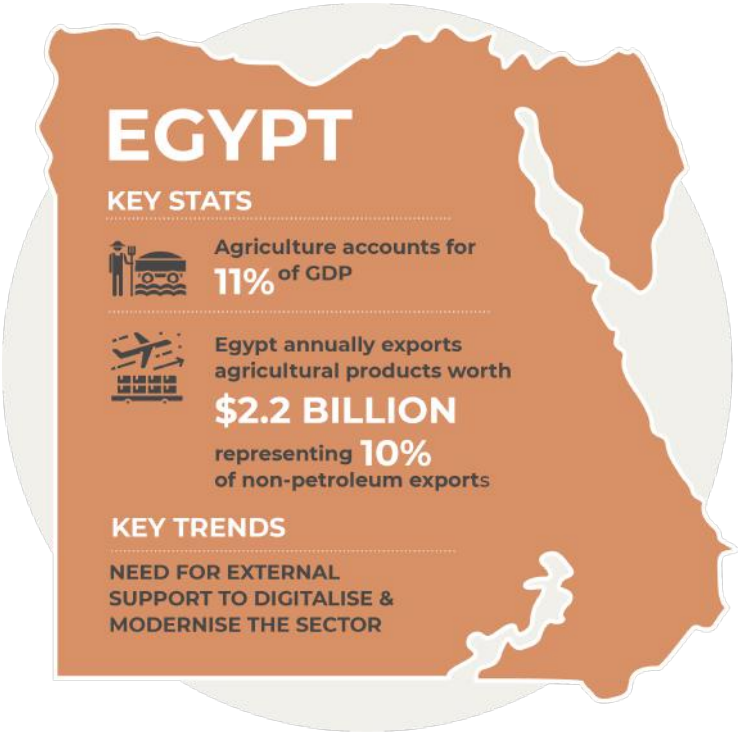
The government views the agriculture sector, specifically the cocoa sector, as a key avenue for driving post-pandemic economic recovery, providing multiple opportunities for Microsoft:

- **E-extension services**. The director of the Agriculture Extensions Service within the Ministry of Food and Agriculture, Paul Siameh, has recently issued a call for greater public and private investment in the e-agriculture space, and has urged agritech companies to ramp up their research into digital tools which will propel the expansion of advisory services to hard to reach farming communities.

- **Information management in the cocoa sector.** In Ghana, cocoa production operates under a single, government-controlled marketing system known as COCOBOD. COCOBOD's organisational structure is currently highly inefficient, and the government has expressed a need for improved data collection and analysis (including the mapping of farming communities), as well as a need for more robust accounting and administrative systems. Additionally, the sector is in dire need of more advanced land management systems, and traceability tools to combat fraud and illicit activity.

4.2.3 Egypt

With the country's agriculture sector expected to grow by 20% from 2018 to 2024, Egypt is an exciting prospect for agritech providers. Innovations in Egypt have largely been concentrated at the grassroots level, and large-scale private investment in the agritech space is still in its nascent phase. The government is now taking on a more central role in pushing for agricultural innovation, but requires significant external assistance to achieve its goals.



The policy environment for digital agriculture is becoming increasingly robust in Egypt. The government's Egypt Vision 2030 positions sustainable agriculture as a key pillar of national development.

The government also has in place a Central Laboratory which provides meteorological data to support precision agriculture, and in August 2020, the Ministry of ICT and Ministry of Agriculture signed a joint protocol to develop the Ministry of Agriculture's ICT infrastructure.

Agriculture has been at the centre of donor initiatives for over 20 years, and in 2020, the government set out a USD 545 million agri-investment plan which will require significant donor support. Key donors include the UNDP, USAID and GIZ, who are all providing support in building value chain resilience.

In 2018, Egypt was ranked as the fastest-growing start-up ecosystem in the Middle East and North Africa region.

The startup ecosystem in Egypt currently has a strong focus on precision agriculture, environmental and waste management, dairy farming and water management. Key players include:

- ➔ **AGRIMATIC,** a plant and soil technology company
- ➔ **21 FARMER**, which provides data analytics to smallholder farmers
- ➔ **WASTILIZER**, which converts animal waste into fertilizers
- ➔ **FARMINAL**, which is providing high tech solutions to improve productivity and reduce GHG emissions in the dairy sector;
- ➔ **BUSTAN**, a startup specialising in aquaponics (i.e. water-friendly farming)

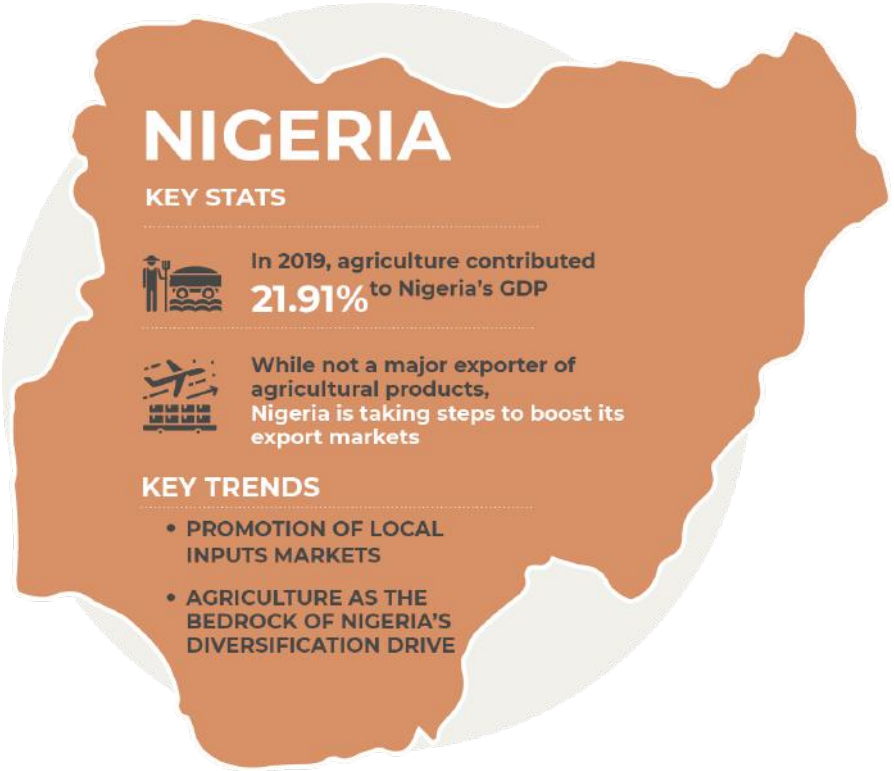
Egypt's leading independent agritech innovation hub is **FALAK STARTUPS**. There are also two government-run hubs, **BEDAYA** and **TIEC**, which are not agriculture-focused but specialise in developing digital skills across sectors.

The government's efforts to accelerate the growth of the sector provides numerous potential opportunities for Microsoft:

- **Input markets projected to expand.** As part of its Egypt Vision 2030, the government has called for the rapid expansion of the fertilizer and seeds markets, as a means of ensuring improved yields in the next decade. If implemented effectively, this will create an expanded market for agritech providers, as agribusinesses and governments require innovative technologies to reach more farmers with inputs.

- **Expanding partnership landscape:** The majority of agritech innovations in Egypt are still being led by the government, which is increasingly looking to partner with external donors. Since 2017, the government has been seeking more multilateral support to digitalise aspects of the agriculture sector - in 2019, this led the government to sign a cooperation agreement with the FAO for the creation of a digital model of agricultural extension.

4.2.4 Nigeria



While agriculture in Nigeria has historically accounted for only a small proportion of overall exports, the government is committed to promoting the sector as a key driver of diversification, as it seeks to reduce reliance on oil and gas revenues. This has seen agriculture take on a more privileged status in economic development planning, and will facilitate investment, both from government and donors.

The government has put in place a robust set of policies to support agricultural growth. Vision 2020 and the overarching Economic Recovery and Growth Plan call for economic diversification, and various policies have placed agriculture at the centre of this. Notable here is the Agricultural Promotion Policy (APP, 2016-2020), which aimed to improve food security and strengthen access to international markets.

Digitalisation in Nigeria's agriculture sector has advanced rapidly thanks to a favourable enabling environment. Vision 2020 has endorsed ICT as a key factor in growing the sector, and the E-Government Department within the Federal Ministry of Communications Technology is working closely with the Federal Ministry of Agriculture to roll out digital services, including the National E-Agriculture Portal, which allows

farmers to access crucial information to improve yields. The APP has also promoted the use of spatial data, GIS, satellite and other data for planning and monitoring of the sector.

Nigeria has a strong relationship with the international donor community, which is becoming increasingly interested in the agritech space. Development finance institutions such as the Global Innovation Fund and FMO (the Dutch development bank) have provided debt to multiple local solutions providers, including Babban Gona, which aims to provide cost-effective solutions to farmers. International donors – such as GIZ, DFID, USAID, and the Australian government – have also provided concessional loans to emerging startups, including Hello Tractor, Verdant AgriTech, among others. These donors are paving the way for further private investment by increasing visibility and interest in new digital solutions.

Nigeria hosts one of the continent's most exciting startup scenes. Lagos specifically has become a key national and regional hub for innovation, and is home to numerous tech hubs and international tech players.

Some high-profile local agritech startups include:

- ➔ **FARMCROWDY,** a platform connecting potential investors to farmers
- ➔ **ZENVUS**, a technology developer which supplies farmers with precision agriculture tools
- ➔ **VERDANT AGRITECH,** which provides farmers with mobile platforms to monitor markets, access finance and extension services

The ecosystem is supported by a variety of hubs, the most prominent of which are: Facebook's Lagos-based **NG_HUB,** run in partnership with **CCHUB, STARTUPGRIND,** part of Google's global hubs network, and **PASSION INCUBATOR,** an early-stage technology incubator.

The government has placed agriculture at the centre of its diversification efforts, meaning increased future investment in the sector. To achieve this, the government has taken a series of steps to promote and localise its agriculture sector.

- **Localisation of production and inputs:** In 2019, the government closed its borders with Benin and Niger, in order to prevent the smuggling of agricultural goods into Nigeria, a practice that was severely undermining domestic markets. In 2020, President Buhari ordered the central bank to reduce foreign exchange provisions for the import of fertilizers and seeds in order to bolster the domestic inputs market. Since this time, the government has sought to develop state-led input subsidy schemes to boost sector growth.

- **Localisation of processing**: The government is working closely with international partners to develop domestic processing capacity and reduce vulnerability to global supply chain disruptions. For example, in February 2020 the government launched discussions with the African Development Bank for the

development of Special Agro-Industrial Processing Zones in Nigeria. The government is also looking to develop a USD 1 billion crop processing park in northern Nigeria with assistance from Turkish investors. It is hoped these facilities will help the country boost its agricultural exports and reduce its reliance on oil revenues.

5 ANNEX: CHALLENGES

While the enabling environment is becoming increasingly robust, there remain a number of fundamental challenges to the development of digital agriculture in Africa.

5.1 Pan-continental challenges

CHALLENGE	CONTEXT	MITIGATION MEASURES
INSUFFICIENT HUMAN CAPITAL	Illiteracy and lack of digital skills is hindering uptake of solutions	Increasing number of of tech hubs and digital training initiatives across Africa
ABSENCE OF ROBUST DIGITAL INFRASTRUCTURE	Lack of investment in enabling agriculture data systems (mainly farmers' registries)	Some governments have taken steps to develop registries, including Ethiopia's 80-28 input subsidy database, which hosts around 4 million farmers.
FRAGMENTED POLICY LANDSCAPE	National level policies still lack coherence, which risks undermining investor confidence in the long term.	Increased collaboration through the AfCFTA may facilitate stronger cohesion.
ABSENCE OF OPEN DATA	Africa ranks below other regions on access to open government data, placing increased pressure on the private sector to collect and analyse data.	Open data is gaining prominence on government agendas. In West Africa, for example, regional ministries of finance and agriculture are coordinating to establish regional data-sharing capacity.

5.2 Consumer-level barriers

To truly assess the market value, it is necessary to understand the value that the key customers attach to the provided solutions, and thus the investment that could be freed. Given the strong, though not exclusive focus, on smallholders and medium-sized farms, the assessment warrants an analysis of the key consumer-level barriers and how these barriers may impact consumers' ability to understand the advantages of the services being offered and their ability to pay for these services. These limitations have informed the expenditure level assumptions used in the above model, and are thus reflected in the minimum and maximum values under all three scenarios.

- **Digital literacy:** While digital literacy rates are slowly increasing in Africa, particularly among the continent's youth, smallholder farmers residing in remote locations continue to lag behind. This is

hindering farmers' appreciation of the value digital solutions could bring to their operations, and those farmers who do adopt digital solutions often struggle to manage data and information systems effectively due to a lack of digital experience.

- **Affordability**: Smallholder farmers face numerous challenges to accessing finance and credit facilities, most notably their lack of education on financial products, their remote location which makes them difficult to reach with mobile finance services, and their lack of digital literacy. However, middle-sized farmers have also faced challenges in accessing financial products. Zambia, for example, has seen over a 100% increase in medium-scale farming activity in the last 15 years; however, many of these farmers still struggle to obtain the financing they need to acquire crucial inputs and grow their businesses as they are still considered to be too nascent and high risk to be eligible for a bank loan.

- **Willingness to pay for services**: Recent surveys carried out by CTA have demonstrated that, on the whole, smallholder farmers are rarely willing to pay for digital services and tools until they have personally seen the advantages for their business and actively benefited from them. While there is a growing willingness among some farmers to pay for services which have a more tangible impact, such as market linkage services, many organisations which offer such solutions are opting to sell to other businesses, who are more willing to pay, as a means of reaching farming communities indirectly.

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